

Amend Claim 3 to read as follows:

3. (Amended) The method of claim 33, wherein each of steps (b) and (d) is independently characterized by spectral resolution ranging between 1 nm and 50 nm and spatial resolution ranging between 0.1 mm and 1.0 mm.

Amend Claim 4 to read as follows:

4. (Amended) The method of claim 33, wherein each of steps (b) and (d) is effected via an interferometer-based spectral imaging device.

Amend Claim 6 to read as follows:

6. (Amended) The method of claim 33, further comprising the steps of generating individual spectra-images from spectra acquired in steps (b) and (d).

Claim 7 (not amended):

7. The method of claim 6, wherein said spectral-images are generated by attributing each of the pixels in the images a distinctive color or intensity according to oxygen saturation and/or blood volume characterizing its respective picture element in the cortex.

Amend Claim 8 to read as follows:

8. (Amended) The method of claim 33, wherein the subject is awake.

Amend Claim 9 to read as follows:

9. (Amended) The method of claim 33, wherein the subject is anesthetized.

Amend Claim 10 to read as follows:

10. (Amended) The method of claim 33, wherein step (c) is effected by asking the subject to perform a task.

Claim 11 (not amended):

11. The method of claim 10, wherein said task is selected from the group consisting of reading, speaking, listening, viewing, memorizing, thinking and executing a voluntary action.

Amend Claim 12 to read as follows:

12. (Amended) The method of claim 33, wherein step (c) is effected by a method selected from the group consisting of passively stimulating the brain through the peripheral nervous system of the subject and directly stimulating the cortex.

Amend Claim 13 to read as follows:

13. (Amended) The method of claim 33, further comprising the step of generating an anatomical image of the exposed cortex and co-displaying said image highlighting differences among spectra of the exposed cortex and the anatomical image of the exposed cortex.

Claim 14 (not amended):

14. The method of claim 13, wherein said image highlighting differences among spectra of the exposed cortex and the anatomical image of the exposed cortex are co-displayed side by side.

Claim 15 (not amended):

15. The method of claim 13, wherein said image highlighting differences among spectra of the exposed cortex and the anatomical image of the exposed cortex are superimposed.

Amend Claim 16 to read as follows:

16. (Amended) The method of claim 33, wherein step (e) comprises a use of at least one threshold while generating the image highlighting differences among spectra of the exposed cortex acquired in steps (b) and (d).

Amend Claim 17 to read as follows:

17. (Amended) The method of claim 33, wherein said image highlighting differences among spectra of the exposed cortex acquired in steps (b) and (d) is color or intensity coded.

Amend Claim 18 to read as follows:

18. (Amended) The method of claim 33, wherein medical lines are connected to the subject on a single side thereof.

Amend Claim 19 to read as follows:

19. (Amended) The method of claim 33, wherein medical lines are connected to the subject on a right or left side thereof.

Amend Claim 20 to read as follows:

20. (Amended) The method of claim 33, wherein medical lines are connected to the subject at locations which are less communicating with the exposed portion of the cortex of the subject.

Claim 21 (not amended):

21. The method of claim 7, wherein said step (e) is characterized by highlighting oxygen saturation and/or blood volume differences of about at least 10%.

Claim 22 (not amended):

22. The method of claim 7, wherein said step (e) is characterized by highlighting oxygen saturation differences and/or blood volume of about at least 5%.

Claim 23 (not amended):

23. The method of claim 8, further comprising the step of also acquiring a reflectance spectrum of each picture element of at least the portion of the exposed cortex of the subject when the patient is briefly anesthetized.

Amend Claim 24 to read as follows:

24. (Amended) The method of claim 33, wherein each of steps (b) and (d) is performed during at least N brain beats of the subject, wherein N is an integer selected from the group consisting of two, three, four, five, six, seven, eight, nine, ten and an integer between and including eleven and forty.

Amend Claim 25 to read as follows:

25. (Amended) The method of claim 33, wherein step (d) is executed more than about 3-5 seconds after initiation of step (c).

Amend Claim 26 to read as follows:

26. (Amended) The method of claim 33, wherein step (d) is executed between about 5 and about 30 seconds after initiation of step (c).

Amend Claim 27 to read as follows:

27. (Amended) The method of claim 33, wherein said stimulation prolongs about 5 to about 30 seconds.

Amend Claim 28 to read as follows:

28. (Amended) The method of claim 33, wherein said stimulation prolongs about 10 to about 20 seconds.

Amend Claim 29 to read as follows:

29. (Amended) The method of claim 33, wherein said filters-based spectral imaging device includes filters selected so as to collect spectral data of intensity peaks or steeps characterizing one or more spectrally monitored substances.

Amend Claim 31 to read as follows:

31. (Amended) The method of claim 33, wherein each of said filters is individually about 5 to about 15 nm full-width-at-half-maximum filter.

Amend Claim 32 to read as follows:

32. (Amended) The method of claim 33, wherein each of said filters is individually about 10 nm full-width-at-half-max filter.

Amend Claim 33 to read as follows:

33. (Amended) A method of functional brain mapping of a subject comprising the steps of:

(a) illuminating an exposed cortex of a brain or portion thereof of the subject with incident light;

(b) acquiring a reflectance spectrum of each picture element of at least a portion of the exposed cortex of the subject;

(c) stimulating the brain of the subject;

(d) during or after step (c) acquiring at least one additional reflectance spectrum of each picture element of at least the portion of the exposed cortex of the subject; and

(e) generating an image highlighting differences among spectra of the exposed cortex acquired in steps (b) and (d), so as to highlight functional brain regions;

wherein each of steps (b) and (d) is effected via a filters-based spectral imaging device;

wherein said filters-based spectral imaging device includes filters selected so as to collect spectral data of intensity peaks or steeps characterizing hemoglobin selected from the group consisting of deoxy-hemoglobin, oxy-hemoglobin and deoxy-hemoglobin and oxy-hemoglobin; and

wherein said filters include N filters selected from the group consisting of an about 540 nm maximal transmittance filter, an about 575 nm maximal transmittance

filter, an about 555 nm maximal transmittance filter, an about 513 nm maximal transmittance filter and an about 600 nm maximal transmittance filter, whereas N is an integer selected from the group consisting two, three, four and five.

Claim 34 (not amended):

34. The method of claim 33, wherein N equals two.

Claim 35 (not amended):

35. The method of claim 33, wherein N equals three.

Claim 36 (not amended):

36. The method of claim 33, wherein N equals four.

Claim 37 (not amended):

37. The method of claim 33, wherein N equals five.

Amend Claim 38 to read as follows:

38. (Amended) The method of claim 33, wherein said filters include at least one multiple chroic filter.

Amend Claim 39 to read as follows:

39. (Amended) A method of functional brain mapping of a subject comprising the steps of:

(a) illuminating an exposed cortex of a brain or portion thereof of the subject with incident light;

(b) acquiring a reflectance spectrum of each picture element of at least a portion of the exposed cortex of the subject;

(c) stimulating the brain of the subject;

(d) during or after step (c) acquiring at least one additional reflectance spectrum of each picture element of at least the portion of the exposed cortex of the subject; and

(e) generating an image highlighting differences among spectra of the exposed cortex acquired in steps (b) and (d), so as to highlight functional brain regions;

wherein each of steps (b) and (d) is effected via a filters-based spectral imaging device;

wherein said filters-based spectral imaging device includes filters selected so as to collect spectral data of intensity peaks or steeps characterizing hemoglobin selected from the group consisting of deoxy-hemoglobin, oxy-hemoglobin and deoxy-hemoglobin and oxy-hemoglobin; and

wherein said filters include at least one filter of maximal transmittance at a wavelength which corresponds to at least one isosbathic point of deoxy-hemoglobin and oxy-hemoglobin and at least one additional filter of maximal transmittance at a wavelength which corresponds to at least one non-isosbathic point of deoxy-hemoglobin and oxy-hemoglobin.

Amend Claim 40 to read as follows:

40. (Amended) The method of claim 33, wherein said reflectance spectrum of step (b) is an averaged reference spectrum of N measurements, wherein N is an integer and equals at least 2.



Amend Claim 41 to read as follows:

41. (Amended) The method of claim 33, wherein said reflectance spectrum of step (d) is an averaged reference spectrum, wherein N is an integer and equals at least 2.

Amend Claim 42 to read as follows:

42. (Amended) The method of claim 33, further comprising the steps of spatially registering spectral data acquired in steps (b) and (d).

Amend Claim 43 to read as follows:

43. (Amended) The method of claim 39, wherein said image highlighting differences among spectra of the exposed cortex acquired in steps (b) and (d) is highlighting oxygen saturation and/or blood volume differences.

Claim 44 (not amended):

44. The method of claim 43, wherein step (e) comprises a use of at least one threshold while generating the image highlighting differences among spectra of the exposed cortex acquired in steps (b) and (d) of oxygen saturation and/or blood volume differences.

Claim 45 (not amended):

45. The method of claim 44, wherein said at least one threshold includes taking into account only picture elements in which, in step (b), in step (d) or both, an absolute oxygen saturation and/or blood volume is above a predetermined first threshold.

Claim 46 (not amended):

46. The method of claim 45, wherein said at least one threshold further includes taking into account only picture elements in which a difference in oxygen saturation and/or blood volume is above a predetermined second threshold.

Claim 47 (not amended):

47. The method of claim 46, wherein clusters of neighboring picture elements above said first and said second threshold, said clusters include less than a predetermined number picture elements, are discarded.

Claim 48 (not amended):

48. The method of claim 44, wherein said at least one threshold includes taking into account only picture elements in which a difference in oxygen saturation and/or blood volume is above a predetermined threshold.

Claim 49 (not amended):

49. The method of claim 44, wherein said at least one threshold is effected by discarding clusters of neighboring picture elements which include less than a predetermined number picture elements highlighting differences among spectra of the exposed cortex acquired in steps (b) and (d) of oxygen saturation and/or blood volume differences.

Claim 50 (not amended):

50. The method of claim 6, wherein said step of generating individual spectra-images from spectra acquired in steps (b) and (d) includes generating color or intensity coded saturation and/or blood volume maps.

Claim 51 (not amended):

51. The method of claim 50, wherein said coded saturation maps are coded oxygen saturation maps.

Claim 52 (not amended):

52. The method of claim 50, further comprising the step of generating an anatomical image of the exposed cortex and co-displaying at least one of said color or intensity coded saturation and/or blood volume maps and the anatomical image of the exposed cortex.

Claim 53 (not amended):

53. The method of claim 52, wherein said anatomical image is a monochromatic image.

Claim 54 (not amended):

54. The method of claim 52, wherein said anatomical image is a grayscale image.

Claim 55 (not amended):

55. The method of claim 52, wherein said anatomical image is a red-green-blue image.

Claim 56 (not amended):

56. The method of claim 52, wherein at least one of said color or intensity coded saturation and/or blood volume maps and the anatomical image of the exposed cortex are co-displayed side by side.

Claim 57 (not amended):

57. The method of claim 52, wherein at least one of said color or intensity coded saturation and/or blood volume maps and the anatomical image of the exposed cortex are superimposed.

Amend Claim 58 to read as follows:

58. (Amended) The method of claim 33, wherein said image highlighting differences among spectra of the exposed cortex acquired in steps (b) and (d), so as to highlight functional brain regions, is coded via color or intensity so as to distinguish degree of said differences in accordance with at least one difference threshold.

Claim 59 (not amended):

59. The method of claim 13, wherein said anatomical image is a monochromatic image.

Claim 60 (not amended):

60. The method of claim 13, wherein said anatomical image is a grayscale image.

Claim 61 (not amended):

61. The method of claim 13, wherein said anatomical image is a red-green-blue image.

Amend Claim 170 to read as follows:

170. (Amended) The system of claim 188, further comprising at least one filter being engaged with said illumination device to adjust the spectrum of the incident light.

Amend Claim 171 to read as follows:

171. (Amended) The system of claim 188, so designed and constructed so as to provide spectral resolution ranging between 1 nm and 50 nm and spatial resolution ranging between 0.1 mm and 1.0 mm.

Amend Claim 172 to read as follows:

172. (Amended) The system of claim 188, wherein said spectral imaging device is an interferometer-based spectral imaging device.

Amend Claim 173 to read as follows:

173. (Amended) The system of claim 188, wherein said spectral imaging device is a filters-based spectral imaging device.

Amend Claim 174 to read as follows:

174. (Amended) The system of claim 188, wherein said image generating device is designed and constructed for generating individual spectra-images from spectra of the exposed cortex acquired before and during and/or after stimulating the brain of the subject.

Claim 175 (not amended):

175. The system of claim 174, wherein said spectral-images are generated by attributing each of the pixels in the images a distinctive color or intensity according to oxygen saturation and/or blood volume and/or blood volume characterizing its respective picture element in the cortex.

Amend Claim 176 to read as follows:

176. (Amended) The system of claim 188, wherein said image generating device is designed and constructed for generating an anatomical image of the exposed cortex and co-displaying said image highlighting differences among spectra of the exposed cortex and the anatomical image of the exposed cortex.

Claim 177 (not amended):

177. The system of claim 176, wherein said image highlighting differences among spectra of the exposed cortex and the anatomical image of the exposed cortex are co-displayed by said image generating device side by side.

Claim 178 (not amended):

178. The system of claim 176, wherein said image highlighting differences among spectra of the exposed cortex and the anatomical image of the exposed cortex are superimposed by said image generating device.

Amend Claim 179 to read as follows:

179. (Amended) The system of claim 188, wherein said image generating device uses at least one threshold while generating the image highlighting differences among spectra of the exposed cortex.

Amend Claim 180 to read as follows:

180. (Amended) The system of claim 188, wherein said image highlighting differences among spectra of the exposed cortex is color or intensity coded by said image generating device.

Claim 181 (not amended):

181. The system of claim 175, wherein said image generating device is set to highlight oxygen saturation and/or blood volume differences of about at least 10%.

Claim 182 (not amended):

182. The system of claim 175, wherein said image generating device is set to highlight oxygen saturation and/or blood volume differences of about at least 5%.

Amend Claim 183 to read as follows:

183. (Amended) The system of claim 188, wherein said spectral imaging device is set for acquiring said reflectance spectra of each of said picture element of at least said portion of the exposed cortex of the subject before and during and/or after stimulating the brain of the subject during at least N brain beats of the subject, wherein N is an integer selected from the group consisting of two, three, four, five, six, seven, eight, nine, ten and an integer between and including eleven and forty.

Amend Claim 184 to read as follows:

184. (Amended) The system of claim 188, wherein said filters-based spectral imaging device includes filters selected so as to collect spectral data of intensity peaks or steeps characterizing one or more spectrally monitored substances.

Amend Claim 186 to read as follows:

186. (Amended) The system of claim 188, wherein each of said filters is individually about 5 to about 15 nm full-width-at-half-maximum filter.

Amend Claim 187 to read as follows:

187. (Amended) The system of claim 188, wherein each of said filters is individually about 10 nm full-width-at-half-max filter.



Amend Claim 188 to read as follows:

188. (Amended) A system for functional brain mapping of a subject, the system comprising:

(a) an illumination device for illuminating an exposed cortex of a brain or portion thereof of the subject with incident light;

(b) a spectral imaging device for acquiring reflectance spectra of each picture element of at least a portion of the exposed cortex of the subject before and during and/or after stimulating the brain of the subject; and

an image generating device for generating an image highlighting differences among spectra of the exposed cortex acquired before and during and/or after stimulating the brain of the subject, so as to highlight functional brain regions;

wherein said spectral imaging device is a filters-based spectral imaging device;

wherein said filters-based spectral imaging device includes filters selected so as to collect spectral data of intensity peaks or steeps characterizing hemoglobin selected from the group consisting of deoxy-hemoglobin, oxy-hemoglobin and deoxy-hemoglobin and oxy-hemoglobin; and

wherein said filters include N filters selected from the group consisting of an about 540 nm maximal transmittance filter, an about 575 nm maximal transmittance filter, an about 555 nm maximal transmittance filter, an about 513 nm maximal transmittance filter and an about 600 nm maximal transmittance filter, whereas N is an integer selected from the group consisting two, three, four and five.

Claim 189 (not amended):

189. The system of claim 188, wherein N equals two.

Claim 190 (not amended):

190. The system of claim 188, wherein N equals three.

Claim 191 (not amended):

191. The system of claim 188, wherein N equals four.

Claim 192 (not amended):

192. The system of claim 188, wherein N equals five.

Amend Claim 193 to read as follows:

193. (Amended) The system of claim 188, wherein said filters include at least one multiple chromic filter.

Amend Claim 194 to read as follows:

194. (Amended) The system of claim 188, wherein said filters include at least one filter of maximal transmittance at a wavelength which corresponds to at least one isosbathic point of deoxy-hemoglobin and oxy-hemoglobin and at least one additional filter of maximal transmittance at a wavelength which corresponds to at least one non-isosbathic point of deoxy-hemoglobin and oxy-hemoglobin.

Amend Claim 195 to read as follows:

195. (Amended) The system of claim 188, wherein said spectral imaging device is designed and constructed for spatially registering spectral data acquired thereby.

Amend Claim 199 to read as follows:

199. (Amended) A system for functional brain mapping of a subject, the system comprising:

(a) an illumination device for illuminating an exposed cortex of a brain or portion thereof of the subject with incident light;

(b) a spectral imaging device for acquiring reflectance spectra of each picture element of at least a portion of the exposed cortex of the subject before and during and/or after stimulating the brain of the subject; and

(c) an image generating device for generating an image highlighting differences among spectra of the exposed cortex acquired before and during and/or after stimulating the brain of the subject, so as to highlight functional brain regions;

wherein said image generating device is designed and constructed for highlighting differences among oxygen saturation and/or blood volume of the cortex;

wherein said image generating device is designed for use of at least one threshold while generating the image highlighting differences among said oxygen saturation and/or blood volume of the cortex;

wherein said at least one threshold includes taking into account only picture elements in which, before, during and/or after said stimulation, an absolute oxygen saturation and/or blood volume is above a predetermined first threshold; and

wherein said at least one threshold further includes taking into account only picture elements in which a difference in oxygen saturation and/or blood volume is above a predetermined second threshold.

Claim 200 (not amended):

200. The system of claim 199, wherein clusters of neighboring picture elements above said first and said second threshold, said clusters include less than a predetermined number picture elements, are discarded.

Amend Claim 201 to read as follows:

201. (Amended) The system of claim 199, wherein said at least one threshold includes taking into account only picture elements in which a difference in oxygen saturation and/or blood volume is above a predetermined threshold.

Amend Claim 202 to read as follows:

202. (Amended) The system of claim 199, wherein said at least one threshold is effected by discarding clusters of neighboring picture elements which include less than a predetermined number picture elements highlighting differences among oxygen saturation and/or blood volume of the cortex.

Claim 203 (not amended):

203. The system of claim 174, wherein said individual spectra-images are color or intensity coded saturation and/or blood volume maps.

Claim 204 (not amended):

204. The system of claim 203, wherein said coded saturation and/or blood volume maps are coded oxygen saturation and/or blood volume maps.

Claim 205 (not amended):

205. The system of claim 203, wherein said image generating device is designed and constructed for generating an anatomical image of the exposed cortex and co-displaying at least one of said color or intensity coded saturation and/or blood volume maps and the anatomical image of the exposed cortex.

Claim 206 (not amended):

206. The system of claim 205, wherein said anatomical image is a monochromatic image.

Claim 207 (not amended):

207. The system of claim 205, wherein said anatomical image is a grayscale image.

Claim 208 (not amended):

208. The system of claim 205, wherein said anatomical image is a red-green-blue image.

Claim 209 (not amended):

209. The system of claim 205, wherein at least one of said color or intensity coded saturation and/or blood volume maps and the anatomical image of the exposed cortex are co-displayed side by side.

Claim 210 (not amended):

210. The system of claim 205, wherein at least one of said color or intensity coded saturation and/or blood volume maps and the anatomical image of the exposed cortex are superimposed.

Amend Claim 211 to read as follows:

211. (Amended) The system of claim 188, wherein said image generating device is designed and constructed to distinguish degree of said differences in accordance with at least one difference threshold.

Claim 212 (not amended):

212. The system of claim 176, wherein said anatomical image is a monochromatic image.

Claim 213 (not amended):

213. The system of claim 176, wherein said anatomical image is a grayscale image.

Claim 214 (not amended):

214. The system of claim 176, wherein said anatomical image is a red-green-blue image.

Amend Claim 249 to read as follows:

249. (Amended) The method of claim 33, wherein said reflectance spectrum of step (b) is an averaged reference spectrum of N brain beats, wherein N is an integer and equals at least 2.

Amend Claim 253 to read as follows:

253. (Amended) The method of claim 33, wherein a plurality of images highlighting differences among spectra are displayed either superimposed, overlaid or integrated.

Amend Claim 254 to read as follows:

254. (Amended) The method of claim 33, wherein step (a) is effected by an illumination device operated with an alternating current characterized by a frequency time.

Claim 255 (not amended):

255. The method of claim 254, wherein (i) an exposure time of all filters of said filters-based spectral imaging device is substantially equal; and (ii) an exposure time of each of said filters is a multiplicity of said frequency time by an integer.

Amend Claim 262 to read as follows:

262. (Amended) The system of claim 188, wherein a plurality of images highlighting differences among spectra are displayed either superimposed, overlaid or integrated.

Amend Claim 262 to read as follows:

263. (Amended) The system of claim 188, wherein said illumination device is operated with an alternating current characterized by a frequency time.

Claim 264 (not amended):

264. The system of claim 263, wherein (i) an exposure time of all filters of said filters-based spectral imaging device is substantially equal; and (ii) an exposure time of each of said filters is a multiplicity of said frequency time by an integer.

Claim 268 (not amended):

268. The method of claim 13, wherein the anatomical image includes text identifying brain portions.

Amend Claim 269 to read as follows:

269. (Amended) The method of claim 33, wherein at least one orientation element is placed on the exposed portion of the cortex prior to step (b), so as to provide orientation.

Claim 270 (not amended):

270. The method of claim 269, wherein said at least one orientation element also serves as a white target.

Claim 271 (not amended):

271. The method of claim 270, wherein at least a portion of said at least one orientation element has an index of refraction close to an index of refraction of the cortex.